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MONTGOMERY T-TUBE REMOVAL: A RARE LIFE-THREATENING EVENT

Anaesthesiology

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ABSTRACT

Montgomery T-tube has been used to maintain tracheal lumen patency. In our case it was removed in a 7yr old child suffering from congenital subglottic stenosis, while removal of the Montgomery T-tube, avulsion of its horizontal limb followed by bleeding at tracheal stoma leads to the obstruction of the airway resulting in a dramatic clinical deterioration. The present case report details our experience with this dangerous complication.

KEYWORDS

INTRODUCTION

The Montgomery T-tube is a device used as a combined tracheal stent and an airway after laryngotracheal surgery[1]. These devices are used rarely and used mainly in a tertiary care center, therefore many anesthetists are not familiar with it. Montgomery T-tube is not a definitive airway like a tracheostomy tube. It has an open vertical and a horizontal limb in the middle part, making it difficult for providing controlled ventilation. Common complications with Montgomery T-tube during anesthesia are air dilution, hypoventilation and awareness, while rarely reported are, T-tube cap inhalation[2], fractured vertical and horizontal limbs of T-tube[3] and T-tube aspiration[4]. Written consent has been obtained from the patient.

Case Report

A case of congenital subglottic stenosis, 7 years, 18kg male child with Montgomery T-tube in situ was scheduled for microlaryngoscopic and bronchoscopic (MLB) assessment under general anaesthesia. He had history of double stage laryngotracheal reconstruction surgery. Balloon dilatation and stent placement was done in 2011 which was replaced by a tracheostomy tube in 2012. In 2015, the tracheostomy tube was replaced by a Montgomery T-tube (external diameter 10mm). On pre-anesthetic evaluation he was accepted for anesthesia. On airway assessment his Mallampati class was 1, no loose teeth and jaw and neck movements were adequate. In the operating room, standard monitoring was instituted. Baseline parameters were – HR 106/ min, BP 105/67 mmHg, ECG: normal sinus rhythm and SpO_2 99%. Before induction of anesthesia difficult airway cart was kept ready. Tracheostomy tube no. 4.0, 4.5 and tracheal tube(uncuffed) size 3.0 ,3.5 and 4.0 mm ID were also arranged since as per the surgeon 3.5mmID tube would fit through the vertical limb of the Montgomery T-tube. Montgomery T-tube suction was done after instilling 0.5 ml, 2% lignocaine in the horizontal limb. It was connected to modified Jackson Rees circuit by a suitable adaptor. Anesthesia was induced with O_2 and Halothane. Intravenous access was secured. Fentanyl 50 ug IV was administered. Anesthesia was maintained with $O_2 + N_2O +$ Isoflurane (0.6%- 1.5%) with intermittent boluses of propofol 10mg IV. Anesthesia was deepened by IPPV, by closing his mouth and nose with the hand. Neuromuscular blocker was not administered throughout the procedure as Montgomery tube is not a definitive airway and intermittent positive pressure ventilation (IPPV) is not possible through it.

After completion of MLB the surgeons decided to remove the Montgomery T-tube and replace it with a tracheostomy tube. When the surgeon started to remove the Montgomery T-tube the mask with O_2 and isoflurane was placed on the face. While the surgeon was trying to remove it by holding its horizontal limb with a forceps and pulling it through the stoma, inadvertent avulsion of the horizontal limb of the T-tube from the rest of the Montgomery T-tube occurred. Due to manipulation near the stoma bleeding also started. Surgeons were attempting to remove the T-tube which now had blocked the airway. Patient was receiving 100% O_2 with face mask but was in obstruction and IPPV was impossible.

SpO_2 started falling; surgeons were informed that airway needs to be secured urgently. Attempts to remove the obstructing tube were unsuccessful. SpO_2 had already fallen below 50%. IPPV with 100% O_2 was still not possible. Surgeons tried to intubate the trachea through T-tube but their attempt failed. SpO_2 was continuously falling and ultimately became unrecordable, HR had also started decreasing (60/min). Atropine 0.3mg IV was given and heart rate increased to 100/min. Tracheal intubation was done by the anesthetist using tracheal tube (uncuffed) no. 3.5mm ID since as per the surgeon ETT no. 3.5 mmID would fit through the vertical limb of the tube. Anesthesia circuit was now attached to ETT and IPPV was started with 100% O_2. Anesthesia reservoir bag was stiff and non-compliant. Empirically adrenaline 20+10 microgram i.v. was administered on the assumption that the patient may also be having severe bronchospasm causing silent chest. Immediately SpO_2 started increasing and bag compliance became better. SpO_2 gradually increased to 100%, heart rate came to its baseline and $EtCO_2$ value to 32 mmHg. Then remaining part of the T-tube was removed and tracheostomy tube(uncuffed) size 4.5 mmID was inserted. Ondansetron 2 mg IV was given 15 min before the end of the procedure. At the end of the surgery patient was kept on 100% O_2, till he became conscious, oriented and obeying commands and then shifted to recovery room on T-piece. The postoperative course was uneventful.

DISCUSSION

The Montgomery T-tube was introduced by Montgomery in mid-1960's to support the trachea following laryngotracheoplasty [1,5,6]. It is a silicone tube comprising of a long vertical and short horizontal (extratracheal) limb. It is available in various sizes, from 4.5 to 16 mm (external diameter). The horizontal limb usually has a luminal cap attached to a ring flange that fits around the ribbed external limb allowing both phonation while capped and also protection from posterior dislodgement in the airway. Controlled ventilation is difficult with T-tube and for positive pressure ventilation the upper vertical end or horizontal end of the tube has to be occluded. Guha A et al used a modified breathing system[1]. They used a Bains circuit and Y-connector which connects fresh gas coming from Bains circuit to the extratracheal limb of the T-tube and face mask or LMA. They added extra fresh gas flow of 50 ml/kg/min to the standard fresh gas flow. Various methods of inserting the T-tube have been described, however

there are no clear recommendations regarding the method for its removal. Removal is generally easy and just requires a steady pull on the extratracheal limb. However, it occasionally becomes difficult if the Montgomery T-tube is in place for a long duration (In this child Montgomery T-tube was in place for approximately 11 months). In patients who have T-tubes in place for long durations, it is possible that the tensile strength may have waned due to wear and tear erosions.

Complications of a T-tube include blockage, issues with mechanical ventilation due to lack of cuff, granulation tissue formation, airway infection, airway bleeding and rarely migration[7,8]. There are few reported cases of breakage of the Montgomery T-tube during its removal[3]. Inhalational induction of anesthesia remains the method of choice in such patient. Tube related airway complications are rare but potentially life threatening as in our case. Prior knowledge of the tracheal tube size that can be passed through the vertical limb of Montgomery T-tube was lifesaving by establishing the airway that had become obstructed during Montgomery T-tube removal.

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